Biomimetic leaf-on-a-cheap to study embolism

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Global warming will lead to increasingly severe droughts and threatens most of the forests across the globe [1]. One of the main dangers of droughts for trees comes from the generation of air embolism, which impairs the sap conduction and potentially leads to their death. In leaves, embolism has been shown spreading intermittently and exhibiting catastrophic events [2]. By using PDMS-based biomimetic leaves to reproduce evapo-transpiration [3], it has been shown for a linear geometry that the presence of narrow constrictions in the leaf veins enables to generate intermittent embolism propagation. This intermittency appears to originate from an elasto-capillary coupling between the air / water interfaces and the compliant structure of the biomimetic leaf venation [4]. This work has been extended on 2D and more complex channels systems, in which different structural parameters of these constrictions are studied. I will present both experimental and numerical results done on these systems and the various perspectives opened by the validation of this leaf-on-a-chip.

References:

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